

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**COMMERCIAL FISHPONDS**

**(ha, acre)  
CODE 397**

**DEFINITION**

A water impoundment constructed and managed for commercial aquaculture production.

**SCOPE**

This standard applies to impoundment's that store water and are managed for commercial aquaculture purposes. It applies to all types of ponds installed or modified for commercial production of fish and other animals and plants, including those for fee harvesting on the site. It does not apply to ponds used for noncommercial aquaculture products grown for home use or recreational purposes. This standard applies to Class (a) dams having a product of storage times effective height of dam of less than  $1.13 \times 10^6$  m<sup>4</sup> (3,000 acre ft<sup>2</sup>) and effective height of dam less than 10.7 m (35 ft).

**PURPOSE**

To provide a favorable water environment for producing, growing, harvesting, and marketing commercial aqua-culture crops to supplement natural food supplies, to control water quality, and for effective use of land, water, and related resources.

**CONDITIONS WHERE PRACTICE APPLIES**

On land where soil conditions, climate, water resources, and topography are suitable for constructing a pond or reservoir for commercial aquaculture production that meets the following criteria and conditions:

1. Water quantity will be adequate considering evaporation, seepage, and need for water exchange.
2. Water quality will be suitable for use in aquaculture production or can be made satisfactory by suitable treatment.
3. Application of practical pond management techniques will achieve the desired level of production on a predictable basis.
4. Access to the site is available or can be constructed and maintained.
5. Provision will be made for any needed treatment of water released downstream from the pond.
6. Ponds will store the recommended depth and area of water needed for specific aquaculture products.
7. The location, design, and installation of ponds will comply with flood plain, wetland, and prime farmland regulations.

**PLANNING CONSIDERATION**

Food Security Act, Swampbuster, and Section 404 of the Clean Water Act provisions must be considered prior to providing assistance.

The owner/operator's objectives will dictate the level of development and management to be planned. The plan must be based on the limitations and potentials of available natural resources. A thorough aquaculture resource assessment must be made to determine the feasibility of the project. The planning is complete when all practice components essential to reaching the cooperator's management objectives have been identified.

## DESIGN CRITERIA

The site must be protected from flooding, sedimentation, and contamination. The soils within the pond area, as well as those in the contributing drainage area, must be checked for residues of pesticides and other harmful chemicals if there is a possibility of contamination.

Commercial fishponds may be: (1) embankment ponds that intercept and store surface runoff water, or (2) excavated ponds that are completely enclosed by an embankment around the outer perimeter and are filled by pumping.

**Embankment ponds.** Earthfill dams and embankments around excavated ponds shall meet or exceed the requirements specified for Pond - 378 with the following additional requirements:

1. The minimum elevation of the top of the settled embankment shall be increased to allow for wave action. This increased allowance shall be as specified in table 1.

Table 1.-Wave Height

Max. Fetch* Length		Wave Height	
<i>m</i>	<i>Ft</i>	<i>m</i>	
< 100	< 330	0.15	0.5
100 - 200	330 - 660	0.31	1.0
200 - 400	660 - 1,320	0.46	1.5
400 - 1,600	1,320 - 5,280	0.61	2.0

\*Fetch is defined as the longest uninterrupted distance traveled by wind or wave.

2. The minimum top width of the embankment shall be 4.3 m (14 ft) and 6.1 m (20 ft), respectively, where it is to be used as a one-lane or two-lane road for management purposes and is nonpublic.
3. Interior embankments constructed for division of water or to direct water flow for circulation shall have adequate cross section

to provide for stability and function for its intended purpose.

**Excavated ponds.** Ponds established by excavating and constructing an embankment around their outer perimeter that excludes outside runoff shall have either an emergency spillway with a bottom width of at least 3.0 m (10 ft) or have an overflow pipe installed with sufficient capacity to remove a 10-yr/24-hr direct rainfall amount or be at least 200 mm (8 in) in diameter, whichever is larger.

A one-foot minimum freeboard from the principal spillway crest or waterline to top of fill shall be required.

The pond bottom should be sloped to the outlet at a gradient of at least 0.06 m per 30 m (0.2 ft per 100 ft).

**Orientation.** Rectangular ponds shall be positioned as nearly as possible as follows: 4.0 ha (10 acres) or less — long axis in the direction of prevailing wind. More than 4.0 ha (10 acres) — long axis perpendicular to the direction of prevailing wind.

**Water supply.** Wells are the most desirable source of water, but any available source may be used if the quality and quantity are adequate. If water is pumped from rivers and streams or other sources where undesirable fish may be introduced, filters must be installed on the intake.

The minimum incoming water supply for adequate maintenance is considered to be 0.4 to 0.6 L/s/ha (15 to 25 gal/min/acre). However, evaporation rates, fish-loading densities, and species requirements will be used in establishing specific rates. Flow shall be measured during periods of lowest flow. The pumping and pipeline facilities shall be located to best serve the pond, taking into account accessibility for maintenance and repair; protection from

overflow and flood hazards; connections to power lines or fuel sources; and future expansion. Water entering the pond shall be aerated to increase dissolved oxygen and dissipate harmful gases if needed. This can be accomplished by falling, splashing, spraying, etc. Also, incoming water shall be as far away from outlet drain as possible so that “short circuits” will be avoided.

**Pipes and conduits.** Pump discharge through levees shall be installed above expected high water, and provisions shall be made to prevent pump and motor vibrations being transmitted to discharge conduits.

**Depth.** The water depths for various species are as shown in table 2. These values are applicable to warm climates. Additional depth is required in cold climates to prevent or minimize winter-kill.

Table 2.-Water depth for various species

Species	Most desirable <i>m(ft)</i>	Minimum <i>m(ft)</i>
Channel catfish	1.2 (4) to 1.8 (6)	<sup>1</sup> 0.76 (2.5)
Crawfish	0.4 (1.5) to 0.6 (2)	0.3 (1)
Minnows, other baitfish	1.2 (4) to 1.8 (6)	0.9 (3)
Trout	<sup>2</sup> 0.9 (3) to 1.5 (5)	0.9 (3)

<sup>1</sup>Ponds used for cage culture shall have a minimum depth of 1.5 m (5 ft) where cages are located. (Minimum clearance below the cage is 0.3 m (1 ft) but as much as 0.9 m (3 ft) is preferred.)

<sup>2</sup>Ponds are supplied by a constant flow of water. If pond is filled only during rainy seasons, a depth of 3 to 3.7 m (10 to 12 ft) over one-fourth or more of the pond area is recommended.

**Drains.** The pond must have facilities for complete as well as partial drainage. Turn-down pipes, quick-release valves, bottom-water release sleeves, or other devices for water level control and pond management are to be included in the construction of the drain facility as appropriate. Pond (378) shall be followed for conduit design and installation of anti-seep collars.

**Pond bottom.** Where fish are harvested by seining, the pond bottom shall be smoothed and free of all stumps, trees, roots, and other debris. Existing channels and depressions in the pond area shall be filled and smoothed

For ponds where crawfish are harvested by trapping, complete clearing and removal of trees, stumps, and other vegetation are not necessary unless required by state or local ordinances.

All pesticides can be toxic to fish. Sites being converted from cropland to aquaculture and sites receiving heavy runoff from cropland should be checked for potentially toxic pesticide residues in the soil. Livestock should be excluded from commercial ponds.

The following values for some basic water quality parameters summarize good growing conditions for catfish, minnows, and crawfish.

Parameter	Channel Catfish	Minnows	Crawfish
Dissolved Oxygen	4mg/l+	4mg/l+	2mg/l min 3mg/l+ preferred
Carbon Dioxide	Near Zero as possible	Near Zero as possible	Near Zero as possible
pH	6.5-9.0	over 7.0	6.5-8.5
Total Hardness	over 20mg/l (not critical with daily feeding)	over 50mg/l	over 20mg/l
Water Temp.	above 70°F, for the best growth around 85°F, growth slow below 60°F & above 90°F	up to 85°F	Between 50°F & 80°F

**Access and safety.** Provisions shall be made for access to the site as well as access for operation and maintenance. Ramps shall be located as necessary to accommodate aeration and harvesting equipment. The maximum grade for equipment access shall be 20 percent (5:1 slope). Generally, level areas or restraining barriers shall be provided to protect pumps, motors, fuel tanks, and utility poles from vehicular traffic. Appropriate safety features and devices shall be installed or made available close by to aid people who fall into the pond and to prevent such accidents.

**Protection.** A protective cover of vegetation shall be established on all exposed soil surfaces that have been disturbed. If soil or climatic conditions preclude the use of vegetation, other protection methods may be used. Adequate provisions must be made to protect earth surfaces from wave erosion and turbulent water at pipe inlets and outlets. Fences shall be installed as necessary to exclude livestock and unwanted traffic. Road surfaces shall be treated if necessary to prevent vehicles from cutting deep ruts or sliding into the pond. Dams and levees shall be crowned to provide positive drainage.

## PLANNING CONSIDERATIONS FOR WATER QUANTITY AND QUALITY

Food Security Act, Swampbuster, and Section 404 of the Clean Water Act provisions must be considered prior to providing assistance.

### Quantity

1. Effects on the water budget, with emphasis on effects on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation, and ground water recharge.
2. Effects on the volume of downstream flow or aquifers that might cause undesirable environmental, social, or economic effects.

### Quality

1. Effects on erosion and the movement of sediment, organics, and soluble and sediment-attached substances.
2. Effects on the visual quality of water resources.
3. Short-term and construction-related effects on the water resources.
4. Effects on the temperature of water discharged.
5. Effects on the movement of dissolved substances below the root zone and toward ground water.

6. Potential for redistributing toxic materials during earth moving.

## **PLANS AND SPECIFICATIONS**

### **1. SCOPE**

Work shall consist of constructing the fishpond and levees and include all clearing, excavation, fill placement, installation for pipe spillway, drains, and other features to lines, grades, and elevations as specified on the drawings and staked in the field. The location of the embankment shall be as shown on furnished drawings or as staked in the field.

### **2. SITE PREPARATION**

The pool and levee area shall be cleared to the extent desired and as shown on the plans. Trees shall be cut as flush with the ground as practical and burned or buried at designated locations.

Clearing of the staked foundation, spillway, and borrow area(s) shall include removal of logs, stumps, roots, sod, and other trash that would prevent a good bond between the foundation and fill material.

### **3. EXCAVATION**

Topsoil from foundation, emergency spillway, and borrow area(s) shall be stockpiled for spreading on the completed dam, levee, and spillway as needed to help establish vegetation. Existing stream channels crossing the foundation area shall be deepened and widened as necessary to remove all stones, gravel, sand, sediment, stumps, roots, organic matter and other objectionable material and to accommodate compaction equipment. Side slopes of the channels and other foundation surfaces shall be left no steeper than 1:1. The foundation area shall be thoroughly scarified before placement of the fill material. Moisture shall be added and soil compacted as necessary so that the first layer of fill material will be bonded to the foundation.

The cutoff trench shall be excavated to the depths, bottom width and side slopes shown on the plans. Material removed from the cutoff trench which is free of boulders, roots, organic matter and other objectionable material may be placed in the downstream one-third of the fill. All excess water shall be removed from the trench and the foundation area when fill material is being placed.

Excavated ponds shall be constructed to conform to the shapes, lines and grades shown on the drawings or as staked in the field. The material excavated from the pond shall be placed so that its weight will not endanger the stability of the pond side slopes and so that it will not be washed back into the pond by rainfall.

### **4. FILL PLACEMENT**

The material placed in the fill and levees shall be free of all sod, roots, frozen soil, stones over six inches in diameter, and other objectionable material. Placing and spreading of the fill material shall begin at the lowest point of the foundation and brought up in approximately horizontal layers not exceeding eight inches thick. These layers shall be reasonably uniform in thickness and shall extend over the entire area of the fill.

The earth hauling or compacting equipment shall be operated over each layer so that reasonable compaction of the fill material will be obtained. A minimum of 5 percent shall be added to fill and levee heights constructed with compaction equipment or having each layer covered by the wheel track of construction equipment during the fill placement process. Without compaction or wheel track coverage, 10 percent added fill and levee heights shall be required. The distribution and gradation of materials throughout the fill shall be such that there will be no lenses, pockets, streaks, or layers of material differing substantially in

texture or gradation from the surrounding material.

Where it is necessary to use material of varying texture and gradation, the more impervious material shall be placed in the upstream and center portions of the fill.

Construction of the fill and levee shall be undertaken only at such times when the moisture content of the fill material will permit a satisfactory degree of compaction and bonding or when moisture can be satisfactorily added and incorporated in dry soil material as it is being placed. The embankment, levees, emergency spillway, and borrow areas shall be finished to a smoothness so the surface can be readily traveled upon by farm type equipment. Final construction shall be considered satisfactory when:

Excavation elevations are within  $\pm 0.1$  foot of design grade or modified grade. Excavation slopes may be flatter than designed but not steeper.

Fill elevations are not less than design height plus settlement. Fill above the required settlement elevation will require extra fill material to maintain side slopes within design limits.

Fill slopes may be flatter than designed but may not be steeper and shall be uniform throughout their length. Allowance for anticipated settlement may be considered when calculating side slopes for construction check.

Selected backfill material shall be placed around structures, pipe conduits, and drainfill or antiseep collars at about the same rate on all sides to prevent damage from unequal loading. Fill adjacent (within one foot) to these components shall be compacted to a density equivalent to that of the surrounding fill by hand tamping or by using manually directed power tampers or plate vibrators.

Care shall be taken during backfill around pipe conduit to prevent uplift of pipe.

Preparation of a shaped bed with one-inch of moist, loose soil supporting about one-third of pipe circumference will help ensure the pipe to soil contact.

Drainfill material placed next to the pipe conduit or other structural features shall be kept free of contaminating fill materials by either placing in a cleanly excavated trench or by keeping the drainfill at least one foot above the adjacent earthfill.

## 5. CONSTRUCTION MATERIALS

Pipe conduit shall conform to appropriate ASTM and federal specifications. Antiseep collars shall be of materials compatible with that of the pipe and shall be installed so that they are water tight. The pipe shall be installed according to the manufacturer's instructions and be firmly and uniformly bedded throughout its length to the specified line and grade shown on the drawings. Used welded steel pipe shall be of good quality, free of pits, dents, or other items that might reduce the durability, capacity, or planned life of the structural measure.

Spillway conduit installations shall be considered satisfactory when the conduit is within  $\pm 0.2$  foot of design grade, has a positive slope toward the outlet, has the required appurtenances (bands, antiseep collars, risers, cathodic protection, etc.) attached, has all surface coating damage repaired, and has adequate backfill and compaction applied.

Concrete used for antiseep collars, riser base, riser crest perimeter protection, or pipe inlet protection shall consist of a mix containing a minimum of six bags per cubic yard and a maximum net water content of seven gallons per bag of cement. A minimum 24 hours curing time shall be allowed before fill material is

placed against the concrete. Concrete shall be placed and finished in an acceptable manner.

Reinforcing steel shall be placed as indicated on the plans and shall be held securely in place during concrete placement. Subgrades and forms shall be installed to line and grade, and the forms shall be mortartight and unyielding as the concrete is placed. Filter and drainage diaphragm materials shall have a gradation equal to the fine concrete aggregate gradation listed in the Highway Department, "Standard Specifications for Road and Bridge construction." The drain shall have a minimum 2-foot thickness of uncontaminated filter material.

## **6. PROTECTION**

A protective cover of vegetation shall be established over all the exposed surfaces of the embankment, levees, spillway, excavation disposal, and borrow area(s). Temporary vegetation may be used until permanent vegetation can be established. The embankment, levee, and/or spillway shall be fenced as needed to protect vegetation from livestock. Surface drainage shall be provided around excavation disposal areas and other areas for non-erosive entry of runoff into the pond or for non-erosive disposal of runoff away from the pond embankment.

## **7. MEASUREMENT**

Excavation volumes from core trench, foundation stripping, stream channel cleanout,

etc., shall be calculated from design sections, surveyed cross sections, or other acceptable methods. Fill material in the embankment or levee shall be calculated to the neat lines of the design section and added to the excavation volume for total borrow volume needed. No additional volume will be added for settlement. Calculations will be to the nearest 1.0 cubic yard. Measurement of conduit and conduit riser shall be the purchased length. Each antiseep collar, connecting band, riser fabrication, and anti-vortex baffle will be individually itemized and accounted for. Concrete for the riser base, antiseep collar(s), and riser crest protection shall be measured to the neat lines of the design dimensions. Reinforcement steel, wire mesh, and any forming required will be included in payment for the concrete. Concrete will be calculated to the nearest 0.1 cubic yard.

Measurement for vegetative plantings area will cover all disturbed areas (embankment, levee, emergency spillway, borrow area, etc.). Areas will be measured to the nearest 0.1 acre.

## **OPERATION AND MAINTENANCE**

A plan for operation and maintenance shall be prepared for use by those responsible for the system. This plan shall provide for inspection, operation, and maintenance of vegetation, pipes, valves, spillways, roads, and other parts of the system.